What is claimed is:

1. A combustion burner comprising:

a mixture nozzle defining a mixture fluid passage through which a **mixture fluid** containing a powdered solid fuel and a conveyor gas for transferring said solid fuel flows toward a furnace;

Some of the Claims of US Patent No: 4,572,084 disclose the following:

What is claimed as new is:

1) In a combustion device for burning a **powdered coal-fluid mixture**. This combustion device consists of: a combustion chamber, first nozzle means communicating with the chamber for spirally swirling the **coal-fluid mixture** along a path in the chamber to form a hollow sheath of **coal-fluid mixture**. A second nozzle means communicating with the chamber and located generally centrally of the hollow sheath for spirally swirling combustible gas-air mixture in the chamber and within the sheath of **coal-fluid mixture** in the same direction of swirl to reinforce the swirling motion of the **coal-fluid mixture** forming the sheath without general mixing therebetween. To promote volatilization and enhance the combustion of the **coal-fluid mixture**, there are means for burning the **coal-fluid mixture** and the gas-air mixture within the chamber. The first supply means fluidly communicating with the first nozzle means for providing **coal-fluid mixture** to the first nozzle means and the chamber, second supply means fluidly communicating with the second nozzle means for providing gas-air mixture to the chamber, the second nozzle means including an elongated insert having upstream and downstream end portions, the downstream end portion of the insert being adjacent the second supply means, a plurality of spaced generally spiral channels in the outer surface of the insert extending from the upstream end portion and terminating in the downstream end portion. The channels communicate between the second supply means and the chamber for spirally swirling the gas-air mixture prior to egressing from the second supply means into the chamber.

2) In a combustion device in accord with claim 1 wherein said **coal-fluid mixture** is a **coal-water slurry**.

3) In a combustion device in accord with claim 1 wherein said means for burning said **coal fluid mixture** is located outwardly of said sheath and includes means for supplying gas-air mixture about said coal-fluid sheath whereby said coal-fluid sheath is more completely combusted.

4.) In a combustion device in accord with claim 1 wherein said **coal-fluid mixture** is a **coal-air mixture**.

Accordingly, Applicant's recitation of "suspended coal dust" or "coal dust slurry" appropriately narrows the Claim in a manner supported in the as-filed disclosure when referring to a "fluid hydrocarbon fuel", or even when referring to a "conventional fluid hydrocarbon fuel". The Examiner with his argument in fact proves the case for Applicant needing to narrow and define the broad description of "fluid hydrocarbon fuel", because someone not skilled in the relevant art would not be readily able to understand the development in automatic coal combustion and the methods of solid carbon conversion to a fluid mixture, as employed for many years especially in the commercial and industrial combustion industry.

A "fluid hydrocarbon fuel" includes any fuel which has its carbon content hydrogenated, and in which powderized carbon is necessarily suspended in a gas or liquid.

I am sure the Examiner is aware of the fact that, if a solid matter is changed to a consistency during which it is in a state of flux and is able to constantly alter its shape, such matter must be considered to have changed its consistency from a solid to a fluid.

Should the Examiner however be able to provide the necessary proof that a finely powderized coal dust suspended in air or water is NOT considered a fluid mixture or a fluid hydrocarbon fuel by the industry, or by anyone skilled in the relevant art for that matter, then Applicant will agree to amend the referred to Claim 59 in the application.

Applicant further provides additional references for the Examiner to determine what is considered a "fluid" and a "liquid", and NOT a solid.

For the Examiner's understanding, the following is the Webster's Dictionary definition of "FLUID":

Definition: Fluid

Adjective

1. Subject to change; variable; "a fluid situation fraught with uncertainty"; "everything was unstable following the coup.

2. Characteristic of a fluid; capable of flowing and easily changing shape.

3. Smooth and unconstrained in movement; "a long, smooth stride"; "the fluid motion of a cat"; "the liquid grace of a ballerina"; "liquid prose".

4. In cash or easily convertible to cash; "liquid (or fluid) assets".

5. Affording change (especially in social status); "Britain is not a truly fluid society"; "upwardly mobile".

Noun

1. A substance that is fluid at room temperature and pressure.

2. A continuous amorphous substance that tends to flow and to conform to the outline of its container: a liquid or a gas.

Specialty Definition: Fluid

Aerospace

A substance which, when in static equilibrium, cannot sustain a shear stress; a liquid or a gas. This concept is only approximated by actual liquids and gases.

Mining

A. The quality, state, or degree of being fluid: a liquid or gaseous state. CF:gas

B. The physical property of a substance that enables it to flow and that is a measure of the rate at which it is deformed by a shearing stress, as contrasted with viscosity: the reciprocal of viscosity.

C. In mineral transport, **the term FLUID is not confined to liquids and slurries, but is also used for finely divided solids that flow readily in aircurrents**, fluosolids reactors, or through dry ball mills.

Fluid Mechanics

A branch of science that deals with the special properties of liquids, vapors and gases.

Based on the expert definition of "Fluid" and "Hydrocarbon Fuel", Applicant is of the opinion that the Claim 59. narration under critic is in fact fully supported in the description of the application in accordance with all requirements of 35 USC 112, first paragraph.

With regards to the recitation of the more narrow ranges in the Claims as to the fuel and air temperature, it appears that the Examiner has accepted Applicant's arguments as to the more detailed temperature ranges of 165 degrees F to auto ignition level for heating, and of plus 50 degrees F to minus 40 degrees F for cooling, as within the original ranges as claimed in the Parent Patent. Applicant specifically recited such more narrow range to distinguish such heating and cooling temperatures from any prior art whch may use such applications but for different reasons and expectations.

Double Patenting

The Examiner correctly agrees that Applicant provided substantial arguments as to the errors in the double patenting rejection, especially when Applicant is relying upon 35 U.S.C. 121 asserting that neither Applicant's prior US Parent Patent 6,736,118 nor the co-pending application 10/798,294 may be applied.

However, it is Applicant's opinion that the Examiner is again in error when opposing such arguments and stating that the Claims of the divisional application 10/798,292 under examination, are not distinct from the Claims of Parent Patent No: 6,736,118.

The Examiner should review the Office Action of application 10/293,357 for Parent Patent No: 6,736,118, wherein Examiner McMahon provides a listing of the groups of Divisions and Election Restrictions requested by the Patent Office under U.S.C. 121, especially providing the specific division under class 431 for various types of heaters, which, as the Examiner already agrees and accepts, includes Claims **56**, A method according to Claim 49, wherein the combustion mechanism is a furnace for commercial or industrial use, and Claim **57**, A method according to Claim 49, wherein the combustion mechanism is a process heater for commercial or industrial use.

As previously identified, the following page is a direct copy of the Election/Restriction from the Patent Office as received by Applicant.

DETAILED ACTION

Note that claims 24 (second instance) through 27 have been renumbered as claims 25-28.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 8-11 and 22-25, drawn to various types of heaters, classified in class 431, subclass ***.

II. Claims 12 and 26, drawn to a single or dual cycle power generator, classified in class 310, subclass 113+.

III. Claims 13 and 27, drawn to a gas turbine engine, classified in class 60, subclass 204+.

IV. Claims 14 and 28, drawn to an internal combustion engine, classified in class 123, subclass 550.

The inventions are distinct, each from the other because of the following reasons:

Inventions I, II, III, and IV are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different modes of operation, different functions and different effects.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Therefore, if such Claims were equally NOT DISTINCT from each other when the Office requested divisions under the Election/Restriction, the Office established the rule that the Claims in such Parent Application become DISTINCT when they are related to the different combustion mechanism classifications as indicated. Otherwise the Office would have viewed the Claims, especially Claim 1., as claiming a combustion method applicable to any combustion process, regardless in which category the combustion mechanism, which benefits from the method claimed, was clssified.

It is therefore obvious that the Examiner is disregarded such Election / Restriction I, as requested by the Patent Office in the Parent Application. Such Restriction I. specifies the Distinct Invention drawn to VARIOUS TYPES OF HEATERS, which would certainly include A FURNACE FOR COMMERCIAL OR INDUSTRIAL USE, as well as A PROCESS HEATER FOR COMMERCIAL OR INDUSTRIAL USE, which are some of the combustion mechanisms claimed in the Present Application.

As the complete Claim **56** reads as follows:

56. **A method** for reducing fuel density while increasing combustion air density, without effecting specified fuel or combustion air volumes, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels, including natural gas and propane gas, in COMBUSTION MECHANISMS having a combustion area and at least one burner therein for converting said fuel into energy, such as heat, thrust or torque, comprising:

a) providing fluid hydrocarbon fuel as fuel for said combustion mechanism;

b) directing said fuel through the fuel supply conduit defining a heat exchanger assembly that extends through a heat transfer zone related to the combustion mechanism;

c) reducing the density of said fuel by heating the fuel as it flows through said heat exchanger assembly to an optimal fuel operating temperature level ranging between 165 degrees Fahrenheit and the fuel's flash point or auto ignition level;

d) maintaining a constant volume of density reduced fuel to the combustion area of said combustion mechanism;

e) providing combustion air for the combustion process in said combustion mechanism;
f) directing said combustion air through an air supply conduit defining an heat exchanger assembly that is operated in a heat transfer zone of said combustion mechanism;
g) increasing the density of said combustion air by cooling the combustion air as it flows through said heat exchanger assembly to an optimal air operating temperature level of between plus 50 and minus 40 degrees Fahrenheit;
h) maintaining a constant volume of density increased combustion air to the combustion area of said combustion mechanism,
WHEREIN THE COMBUSTION MECHANISM IS A FURNACE FOR COMMERCIAL OR INDUSTRIAL USE,

and where the complete Claim **57** reads as follows:

57. **A method** for reducing fuel density while increasing combustion air density, without effecting specified fuel or combustion air volumes, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels, including natural gas and propane gas, in COMBUSTION MECHANISMS having a combustion area and at least one burner therein for converting said fuel into energy, such as heat, thrust or torque, comprising:
a) providing fluid hydrocarbon fuel as fuel for said combustion mechanism;
b) directing said fuel through the fuel supply conduit defining a heat exchanger assembly that extends through a heat transfer zone related to the combustion mechanism;
c) reducing the density of said fuel by heating the fuel as it flows through said heat exchanger assembly to an optimal fuel operating temperature level ranging between 165 degrees Fahrenheit and the fuel's flash point or auto ignition level;
d) maintaining a constant volume of density reduced fuel to the combustion area of said combustion mechanism;
e) providing combustion air for the combustion process in said combustion mechanism;
f) directing said combustion air through an air supply conduit defining an heat exchanger assembly that is operated in a heat transfer zone of said combustion mechanism;

g) increasing the density of said combustion air by cooling the combustion air as it flows through said heat exchanger assembly to an optimal air operating temperature level of between plus 50 and minus 40 degrees Fahrenheit;

h) maintaining a constant volume of density increased combustion air to the combustion area of said combustion mechanism,

...WHEREIN THE COMBUSTION MECHANISM IS A PROCESS HEATER FOR COMMERCIAL OR INDUSTRIAL USE,

It was the same combination of Claim components, but relating to Claims 8, 9, 10 and 11 of the Parent Application, all relating to various types of heaters, that prompted the Office to request the cited Divisions.

If the Examiner continues to argue that Claim 49 is not related to an invention that was considered independent or distinct in the Restriction Requirement requested by the Patent Office in the Office Action of Parent Patent No: 6,736,11, the Examiner may need to again review the related documentation.

To further demonstrate that the Examiner is adding to his errors when stating that the new method Claim 49. now presented is distinctly different from that of the Parent Patent and not related to an invention that was considered independent or distinct, it is Applicant's opinion that the Examiner is in contradiction, and therefore Applicant includes below a part by part comparison of the method claims, showing that in fact the methods claimed are more or less identical:

Claim 1. A method for improving the combustion efficiency of a combustion mechanism operating with fluid hydrocarbon fuel, having an ignition and combustion area therein to convert said fuel into heat, thrust, torque or other type of energy, resulting in the reduction of fuel consumption and harmful emissions without effecting performance output of the combustion mechanism, comprising:

Claim 49. A method for reducing fuel density while increasing combustion air density, without effecting specified fuel or combustion air volumes, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels, including natural gas and propane gas, in combustion mechanisms having a combustion area and at least one burner therein for converting said fuel into energy, such as heat, thrust or torque, comprising:

1. a) providing a constant volume of ambient temperature fluid hydrocarbon fuel as fuel for said combustion mechanism;

49. a) providing fluid hydrocarbon fuel as fuel for said combustion mechanism;

1. b) directing said constant volume of fuel through a primary fuel supply conduit defining a heat exchanger assembly that extends through a heating zone having a fuel inlet and a fuel outlet;

49. b) directing said fuel through the fuel supply conduit defining a heat exchanger assembly that extends through a heat transfer zone related to the combustion mechanism;

1. c) reducing fuel density by reducing fuel mass in said constant volume of fuel through heating the fuel to an optimal operating temperature of between 100 degrees Fahrenheit and the fuel's flash point temperature as it flows through said fuel heat exchanger assembly;

49. c) reducing the density of said fuel by heating the fuel as it flows through said heat exchanger assembly to an optimal fuel operating temperature level ranging between 165 degrees Fahrenheit and the fuel's flash point or auto ignition level;

1. d) maintaining a constant volume of heated low density fuel for ignition in the combustion area of said combustion mechanism;

49. d) maintaining a constant volume of density reduced fuel to the combustion area of said combustion mechanism;

1. e) providing a constant volume of ambient temperature air as combustion air for said combustion mechanism,

49. e) providing combustion air for the combustion process in said combustion mechanism;

1. f) directing said constant volume of combustion air through a primary air supply conduit defining a heat exchanger assembly that extends through a cooling zone having an air inlet and an air outlet,

49. f) directing said combustion air through an air supply conduit defining an heat exchanger

1. g) increasing air density by increasing air mass in said constant volume of combustion air through cooling the combustion air to an optimal operating temperature of between ambient and minus 40 degrees Fahrenheit as it flows through said air heat exchanger assembly;

49. g) increasing the density of said combustion air by cooling the combustion air as it flows through said heat exchanger assembly to an optimal air operating temperature level of between plus 50 and minus 40 degrees Fahrenheit;

1. h) maintaining a constant volume of cooled high density air for combustion in the combustion-area of said combustion mechanism.

49. h) maintaining a constant volume of density increased combustion air to the combustion area of said combustion mechanism.

As the Examiner is able to determine, the preamble in Clain **49** differs only to the extent that it already makes reference to some of the distinctions of the Invention disclosed separately in the **1. a)** to **1. h)** listings of the Parent Patent, but does certainly not disclose any new or different matter, except for the difference in type of combustion mechanism which caused the Patent Office to request the Division.

However, in order to resolve the matter in short, Applicant will amend Claim 49. and Claim 61. to more precisely reflect the wording used in Claim 1. and 14. of Parent Patent 6,736,118, while at the same time rstricting the same Claims 49. and 61. such as to solve any further Double Patenting Rejection and Claim Rejections under 35 USC 102, and 103.

Should the Examiner however continue to insist that rejection under Double Patenting is still applicable, I formally request for the Examiner to officially verify to Applicant that the Invention claimed in this Application No 10/798,292 is already disclosed in either the Parent Patent No: 6,736,118, or in Application No: 10/798,294, specifically confirming that the US Patent Office under Examiner McMahon has issued the Requirement for Divisional in error. I would then further request for the Examiner to activate the process for refund of the unnecessary Filing Fee for this Application 10/798,292, for Application 10/798,294, and for a refund of the cost for Request for Continued Examination of this Application 10/798,292.

In any event, Applicant herewith attaches the required replacement Claim Sheets, showing the Claim Amendments for the Examiner's consideration.

Claim Rejections - 35 USC 102

Here the Examiner has not accepted Applicant's previous arguments agains such rejection posed by the Examiner. Applicant will therefore elaborate on his citations and previous response.

Applicant first draws attention to the fact that, as is well known to anyone versed in the art, that the process of superheating cryogenic non-combustible fluids is performed for a specific purpose and to achieve specific results, and such practice and process is not be compared with the preheating of non-cryogenic combustible fluids, even though the heating steps may appear to be similar.

The Examiner should first familiarize himself with the following terms and condition of "Cryogenic Fluids" as explained in Webster's Dictionary:

MERRIAM-WEBSTER online dictionary

cryogenic

2 entries found for **cryogenic.**
To select an entry, click on it.

Main Entry: **cryogenic**
Pronunciation: "krI - & - " je - nik
Function: *adjective*

1 a : of or relating to the production of very low temperature
b : being or relating to very low temperatures
2 a : requiring or involving the use of of a cryogenic temperature
b : requiring cryogenic storage
c : suitable for storage of a cryogenic sustance

cryogenically
adverb
/ - ni - k (& -) 1 E /

Production and Application of Low-Temperature Phenomena.

The cryogenic temperature range has been defined as from -150° C (-238° F) to absolute zero (-273° C or -460° F), the temperature at which molecular motion comes as close as theoretically possible to ceasing completely. Cryogenic temperatures are usually described in the absolute or Kelvin scale, in which absolute zero is written.....

The Examiner will find that a Cryogenic Fluid, in order to qualify as such, has to be at a temperature of between minus 238 degrees Fahrenheit to minus 460 degrees Fahrenheit, and that a reference to the superheating of such fluid usually involves an increase of temperature from minus 460 degrees F to ambient, where the ambient temperature may be as high as 100 degrees F, but seldom higher. Superheating of a Cryogenic Non-Combustable Fluid is required to convert it to a Non-Cryogenic Combustable Fluid, such as to thereby facilitate actual ignition and combustionability of such fluid, and no combustion efficiency advantages in any of the

combustion equipment operated to achieve such Cryogenic Conversion are anticipated, certainly not any of the combustion efficiency advantages claimed in Applicant's Invention.

The Examiner Cites the following paragraph:

(b) the invention was patented or described in a printed publication in this or in a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States.

The Examiner cites that Claims 49, 51, 54, 55, 58 - 61, 63, 66 - 68, and 70 are rejected as being anticipated by Arenson in his Patent 3,720,057.

The Examiner continues to make incorrect and incomplete assumptions when citing further:

The following is a quotation of the appropriate paragraphs of 35 USC 102 that form the basis for the rejection under this section made in this Office action:

A person shall be entitled to a patent unless -

b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 49, 51, 54, 55, 58 - 61, 63, 66 - 68, and 70 are rejected under 35 USC 102(b) as being anticipated by US Patent No. 3,720,057 to Arenson ("Arenson").

Arenson discloses in Figure 1 - 4 the invention described in Applicant's claims 49, 51, 54, 55, 58 - 61, 63, 66 - 68, and 70. In particular, in Figure 3, Arenson shows a process and device where a first heat exchanger assembly (116) extends through a first heat transfer zone related to the combustion mechanism and a second heat exchanger assembly (126) extending through a second heat transfer zone of the combustion mechanism. The fuel supplied through conduit (120) is heated at heat exchanger (116), which is heated by exhaust gases from a

combustion mechanism conveyed through line (114). Air is conveyed through conduit (128) to the second heat exchanger (126). Example 2 (beginning in column 12) shows that natural gas leave heat exchanger (116) at a temperature of 168 degrees F and that air leaves heat exchanger (126) at a temperature of 40 degrees F. These specific examples fall within Applicant's claimed temperature ranges.

In regards to claims 55 and 68, in order for the combustion device (gas turbine engine 112) of Arenson to operate, there is necessarily some means for converting the oxidation mixture of fuel and air into high temperature, high velocity combustion products. Further, as shown in Figure 1, the exhaust products are used to heat a first heat exchanger (32) and additional heat exchanger (46), which is considered to be a related energy transfer system.

Based on such far fetched reasoning, it is obvious that the Examiner is not familiar with the general combustion process of a combustible fluid hydrocarbon fuel.

The Examiner would have otherwise noticed immidiately that the referenced Invention by Arenson does not disclose a method for combustion efficiency improvement in a combustion mechanism, as in Applicant's case being a furnace or a process heater, but discloses instead the use of a combustion mechanism, it being a turbine, for the sole purpose of converting a liquified cryogenic fluid to a vapour. It is obvious that the method and process disclosed by Arenson is for the sole purpose of converting said cryogenic fluid, which needs to be superheated to change a cryogenic to a vaporeous state in order to become combustible.

As stated before, a cryogenic fluid, in order to be classified as cryogenic, must be at a temperature between minus 238 degrees Fahrenheit and minus 460 degrees Fahrenheit. Therefore, as the illustrations of the Arenson Invention readily shows, all energy produced by turbine 28 is used to vaporize the cryogenic fluid, and for operating the various pumping and fluid transport means of the vaporizing mechanism. Therefore, the Arenson Invention discloses a method to convert a non-combustible fluid to a combustible fluid, whereas Applicant's Invention discloses the efficiency improvement of a combustor using a combustible fluid.

Examiner will notice that the liquid cryogenic fluid from storage container 12, which fluid during storage must be constantly maintained at a suitable temperature of up to minus 460 degrees Fahrenheit, is transported past the turbine mechanism, which is only operational to provide both rotational energy for transporting the fluid through the heat exchangers, and to provide heat required to conert the cryogenic liquid into a vaporeous fluid. The Examiner will further notice that in all Arenson illustrations the method disclosed provides a provision for the flow-through and final outlet of the treated and vaporized cryogenic fluid. This clearly confirms that the turbine is used only as a mechanism to convert a cryogenic fuel from a liquid to a vapour, and therefore, a person of ordinary skill in the art would never perceive or anticipate the method disclosed in Applicant's disclosure to be based on Arenson.

The intermittant cooling of the inlet air claimed by Arenson is used strictly for the purpose of cooling the turbine rotators, which would otherwise superheat, as the turbine is mainly used as s heater , and would interfere with the performance of its rotary action.

Applicant's arguments undoubtably proove that the Examiner is totally in error when citing the Arenson Patent as basis for a Claim Rejection under 35 USC paragraph 102.

Therefore, when citing the Arenson invention as an objection to this Application, the Examiner is incorrectly comparing Applicant's invention, which, as defined by the Director of the US Patent Office is a distinct and independent invention under classification 431 (according to Distinct Invention I, various types of heaters class 431), with an invention under classification 60 (according to Distinct Invention III, a gas turbine engine class 60) . Therefore citing such objection for this application must be considered inappropriate.

The difference and uniqueness of Applicant's Invention and the results anticipated and achieved over Arensen are obvious when both the description and the Claims are properly understood by someone with sufficient skill in the relevant art.

Claim Rejection - 35 USC paragraph 103

The Examiner cites the following when quoting 35 USC 103 (a) which forms the basis for all obviousness rejections set forth in this Office action:

a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The above cited section 103 (a) in fact outlines precisely why the Examiner is incorrect when presenting his obviousness rejection thereunder, because this section specifically states very clearly that ".... *the subject matter sought to be patented and the prior art are such that THE SUBJECT MATTER* ***AS A WHOLE*** *would have been obvious.....",* which the Examiner has completely failed to recognise.

When the Examiner cites:...."*Claims 50, 52, 53, 56, 62, 64, 65, and 69 are rejected under 35 USC 103(a) as being unpatentable over Arenson as applied to the claims above and further view of US Patent No. 5,888,060 to Velke ("Velke")"* the Examiner is listing only some of Applicant's dependent Claims, which do not at all disclose or describe the invention. All the above cited Claims are dependent Claims, and as such are meaningless without inclusion of the wording and the description of the independent Claim to which they relate aand on which they depend.

In fact, when using rejected Claim 56 as an example, said Claim already reads *"A method according to Claim 49, wherein the combustion mechanism is a furnace"*
which, when used for the purpose of comparing against prior art should be viewed in its entirety, or as " *THE SUBJECT MATTER* ***AS A WHOLE"*** , whereby Claim 56 would properly read as follows:

*56. **A method** for reducing fuel density while increasing combustion air density, without effecting specified fuel or air volumes, thereby significantly changing the ratio of fuel mass versus combustion air mass, hence oxygen mass, during the process of ignition and combustion of fluid hydrocarbon fuels in combustion mechanisms having a combustion area and at least one burner therein for converting said fuel into heat, thrust, torque or other energy, comprising:*

a) providing a constant volume of fluid hydrocarbon fuel as fuel for said combustion mecanism;

b) directing said constant volume of fuel through a primary fuel supply conduit defining a heat exchanger assembly that extends through a heating zone related to the combustion or exhaust vent area of the combustion mechanism, having a fuel inlet and a fuel outlet;

c) reducing the density of said fuel by reducing fuel mass in said constant volume of fuel through heating the fuel to an optimal operating temperature level ranging between 100 degrees Fahrenheit and the fuel's flash point or auto-ignition temperature level as it flows through said heat exchange assembly;

d) maintaining a constant volume of density reduced fuel for ignition in the combustion area of said combustion mechanism;

e) providing a constant volume of combustion air for the combustion process in said combustion mechanism;

f) directing said constant volume of combustion air through a primary air supply conduit defining a heat exchanger assembly that extends through a cooling zone having an air inlet and an air outlet;

g) *increasing air density of said constant volume of combustion air through cooling said combustion air to an optimal operating temperature of between ambient temperature or plus 50 degrees and minus 40 degrees Fahrenheit as it flows through said air heat exchanger assembly;*

h) maintaining a constant volume of cooled high density air for combustion in the combustion area of said combustion mechanism;

wherein the combustion mechanism is a furnace.

Based on the above demonstration and argument, the Examiner is making incomplete and faulty comparisons with the prior art cited, both the Arenson and the Velke 5,888,060 disclosures. Just because Arenson and Velke teach the use of a heat storage material to support the method of their invention does not preclude that the inventions are similar. In fact they are not similar at all.

The Examiner further states that:

"Arenson discloses all the limitations of claims 50, 52, 53, 56, 62, 64, 65, and 69 ***(28, 30, 31, 34, 35, 40, 42, 43, and 47)*** *except for an insulating or heat storage material forming part of the heat exchanger assemblies, one of the heat transfer zones being related to the combustion area of the combustion mechanism, and that the combustion mechanism is a furnace or process heater".*

The Examiner should have recognised that the Arenson invention discloses the use of heat for converting a cryogenic liquid fluid from its ambient temperature of between minus 260 degrees Fahrenheit and minus 460 degrees Fahrenheit to a vaporised fluid at a temperature anywhere between 6 degrees to a maximum of 168 degrees Fahrenheit. Furthermore, the Examiner should have noticed that Arenson does in fact not claim any pre-ignition fuel operating temperature range in any of his Claims.

Applicant's invention instead discloses the use of a fluid hydrocarbon fuel already at an ambient temperature range of 37 degrees Fahrenheit, a temperature at which the fuel disclosed by Arenson would no longer be in a liquefied cryogenic state, then heating said fuel to a temperature range of between 100 degrees and 900 degrees Fahrenheit. Furthermore, Applicant discloses an invention which combines the heating of said combustible fuel with the cooling of combustion air, a combination specifically for the purpose of increasing the oxygen volume percentage in the combustion process. Therefore it is not at all obvious that:
"the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains",

and as such is actually contrary to the provision in and the intent of 35 USC section 103(a) for the Examiner to pose a rejection thereunder.

The Examiner further cites the following:

Velke teaches a device for pre-heating fluid flue to decrease its density and thus increase efficiency that is considered analogous prior art. In Velke, a heat storage material forms part of a heat exchanger assembly (see col.4, lines 18 - 23) for the purpose of equalising heat transfer from the heating zone to the heat exchanger during on/off cycles of the appliance. Velke also teaches the use of insulating material (21) in the heat exchanger shown in Figure 4 for the purpose of protecting against external heat loss. Velke also teaches that the heat transfer zone is operated from a source other than the combustion or exhaust gas vent area of the combustion mechanism in the case where access to such heat source location is difficult (see col.4, lines 16 -18). Velke further teaches the use of a heat transfer zone being related to the combustion area of the combustion mechanism for the purpose of increasing efficiency of the appliance (see the abstract). The fuel employed is natural gas, propane gas, or other conventional fluid hydrocarbon fuel (see col. 3, lines 64 - 65). In regard to claims 34 and 35, the combustion device disclosed by Velke is a combustion appliance that may be a furnace or heating devices (see col.4, lines 45 - 46 and col.8, lines 45 - 51).

When citing Patent 5,888,060, the Examiner repeats the mistake made with the Arenson comparison. The Examiner is again using dependent Claims in his comparison without referencing and including the basic invention which is specifically disclosed in the independent Claims, which are then narrowed by the dependent Claims. The large temperature range between fuel and air as claimed by Applicant to improve the oxygen ratio, a range as high as 1400 degrees Fahrenheit, would exclude any reason for comparison to establish obviousness.

Furthermore, as is described in 5,888,060 in column 5 lines 31 to 67, the expected result on which the invention is based is the increase in fuel volume ONLY, without claiming an increase in the oxygen ratio. In column 3 lines 9 to Velke discloses that fuel volume may be increased or expanded by some 15% when preheating the fuel to 115 degrees Fahrenheit.

In fact, as anyone familiar in the art understands, a certain advantage may be obtained in the process of combustion when the fuel volume flow, better explained as fuel flow speed, can be increased, an improvement in the combustion process can be obtained. This more specifically describes the invention disclosed in the 5,888,060 Patent.

In the present invention, Applicant distinctly claims an increase of the oxygen ratio in the maintained as specified combustion oxidation mixture volume.

In other words, Velke, in US Patent 5,888,060, instead claims a method resulting in a reduction of fuel consumption by way of increasing fuel volume, or (decreasing fuel density), claiming the advantage of increasing fuel volume to be the invention, but the invention does not contemplate, disclose or even claim any increase in the oxygen ratio in the fuel / air mix (the oxidation mixture) while maintaining specified volumes, nor does the 060 disclosure make any reference to the method of using the combination of heating of fuel and cooling of combustion air for the purpose of improving said oxygen ratio, even though, as the Examiner states, some of the intermediate operating stages disclosed in some of the dependent Claims of both inventions may be similar. Any such similarity of some of the operating components does NOT conclude the basis of both inventions to be identical. In fact, the disclosed methods are in stark contrast.

Although the prior art cited is not relied upon, Applicant nevertheless provided the above response to demonstrate and prove the Examiner's further obvious error.

It must also be noted that, when referencing Patent 5,888,060, the Examiner is not able to cite any Claims of said disclosure in order to substantiate relevancy as to obviousness. All citations are in reference to the description of the invention, but then only to segments and components which are claimed in dependent Claims. Such dependent Claims however do not describe the operating method or device of the invention, but describe instead only certain limitations to the independent Claims

they are to narrow. This includes the use of a heat storage material, the possible employment of a heating zone other than from the combustion mechanism, or a heating zone operated by the combustion mechanism. It further includes reference to a combustion mechanism possibly being a furnace or heating device. These are all references which do not provide any indication of obviousness to a person of ordinary skill in the art at the time the invention was made, including the Arenson disclosure which provides no plausible reason for the obviousness rejection.

The Examiner is of course mistaken when suggesting such conclusion, and Applicant will again provide the necessary expert opinion by someone very skilled in the art, that such conclusion is contrary to expectations in the industry, even when supportive details, and in fact test results, were supplied.

Applicant again provides the Examiner with a copy of an opinion letter by CGRI the Canadian Gas Research Institute:

In a letter addressed to Applicant, dated April 27, 1999, CGRI Research Engineer Martin Thomas provided an opinion on behalf of the Canadian Gas Research Institute, stating that:
"Oxygen enrichment of the combustion air (i.e. increasing the oxygen concentration in a volume of combustion air) is a well established industrial process improvement technique. In our opinion, the "Velke Invention of" *preheating a fuel gas does not provide oxygen enrichment. To our knowledge, oxygen enrichment can only be achieved by adding oxygen to air, or by removing the other constituents (nitrogen, CO2, argon, etc.) from the air.* ***Therefore, we cannot support the claims made for the*** **"Velke Disclosure"** ***as a result of improvements caused by oxygen enrichment."***

CGRI the Canadian Gas Research Institute, a well recognised authority in the gas industry, thereby confirms industry opinion that the any enrichment or increase in the oxygen ratio of a given volume of combustion air can only be achieved by adding actual oxygen, or by

removing the other constituents, but cannot be achieved by any other means, such as preheating of fuel or precooling of combustion air.

CGRI concludes its letter of opinion by stating that "*Because CGRI is unable to explain, through sound scientific principles, the claimed / measured benefits,....CGRI will no longer be involved in the evaluation process.*"

Applicant's invention is therewith definitely confirmed again as being unique. Therefore, the method in 5,888,060, even in conjunction with the details disclosed by Arenson, would not lead any person skilled in the art to the conclusion the Examiner was able to reach. Applicant again believes to have sufficiently demonstrated and proven that the Examiner has made a mistake in his rejection.

Applicant will attach a copy of a confidential report by the ETV Environmental Technology Verification institution, dated as late as June 2000, which institution operates under the Ministry of the Environment, Government of Canada, and further confirms that CGRI Canadian Gas Research Institute admits but to a combustion efficiency improvement of the invention which is relative only to the amount of energy added to the fuel by way of preheating, rather than to any other possible effect. In fact, CGRI considered any other claimed effect as a claim which is considered breaking the law of thermodynamics.

In fact, to this day, the industry only recognizes and agrees with the increase in energy input achieved due to the energy amount and increase resulted from the amount of energy added through pre-heating the fuel, but it has never recognized or agreed to any increase in the kinetic improvement or combustion efficiency improvement due to an increase in the oxygen ratio of the combustion process, and related to fuel pre-heating.

Examiner's Response to Applicant's Arguments

Applicant appreciates Examiner's consideration of the arguments presented by him. Applicant will try again to show why Examiner's opinion is flawed.